NOTE ON FREQUENCY OF HIGH WINDS OVER THE UNITED STATES

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[Manuscript received April 28, 1959; revised May 20, 1959]

Problems of jet aircraft operations and radioactive fall-out have created much interest in high-speed upper-air currents. Also, ever since Rossby's [4] classical paper there has been a lively interest in the dynamics of the jet stream and associated models of atmospheric circulation.

Some earlier climatological assessment of the mean position and strength of the jet stream is contained in the monograph on the jet stream by Riehl et al. [3]. In recent years more reliable observations of high-speed winds have become available. Since 1957 the National Weather Records Center has kept special records on punch cards of all very high wind speeds at United States stations.

For purposes of quick description we set an admittedly arbitrary limit of 100 miles per hour and had a machine compilation made of the frequency of observations equal to or above this value. This collection covers 36 stations with the best upper-wind-observing equipment (either GMD-1 or GMD-1A). It is unlikely that many observations there were missed because of limiting angles.

Although only the data for 1957 and 1958 were available for summarization, the results are sufficiently interesting to warrant a preliminary note. The data are presented in the form of three charts. Lines of equal frequency of occurrence indicate the distribution of high-speed winds in January, July, and for all observations in the two years.

Figure 1 shows the midwinter conditions. The axis of highest frequencies coincides well with the corresponding average position of the jet stream given by Namias and

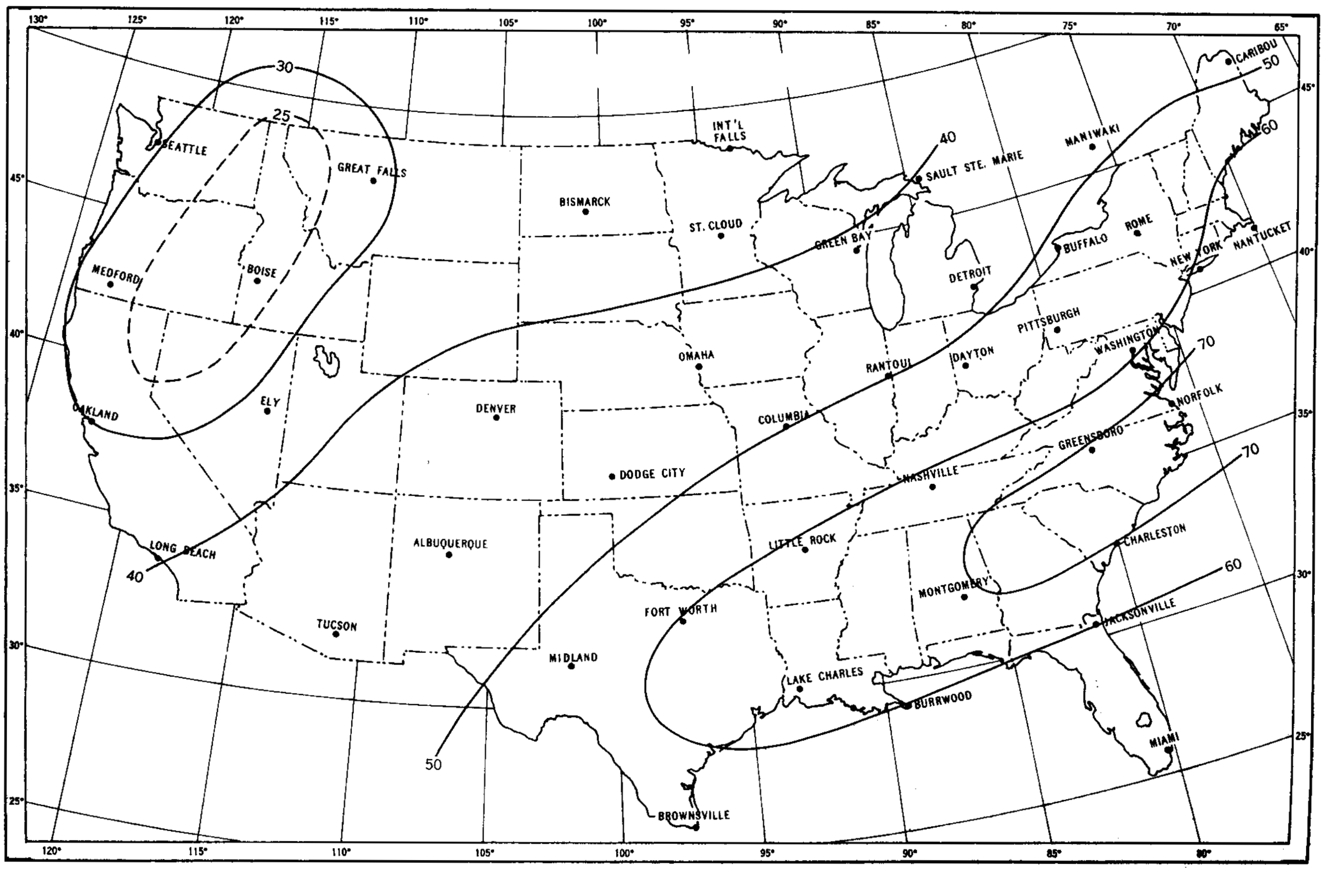

Figure 1.—Percentage of soundings with winds ≧ 100 m.p.h. January 1957–58.

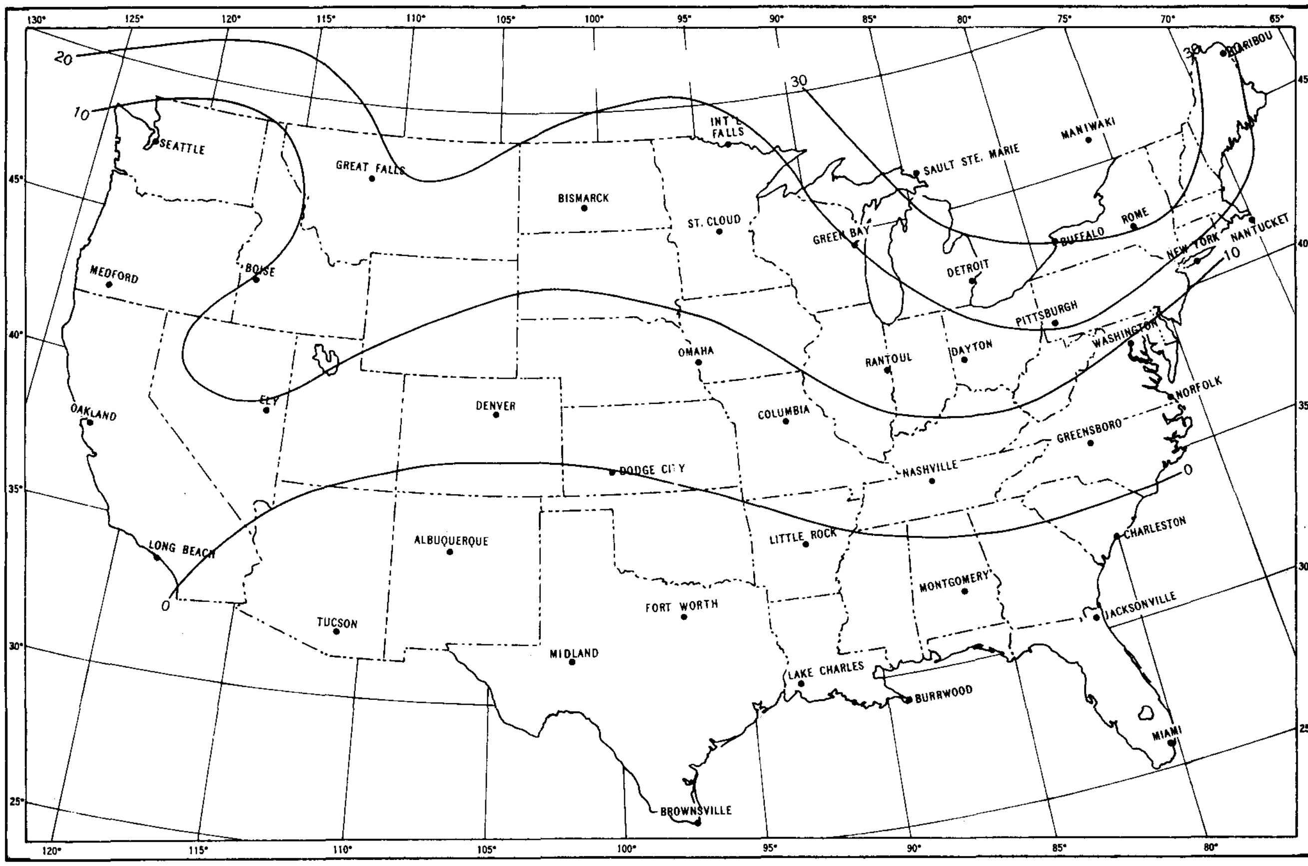

FIGURE 2.—Percentage of soundings with winds ≧ 100 m.p.h. July 1957–58.

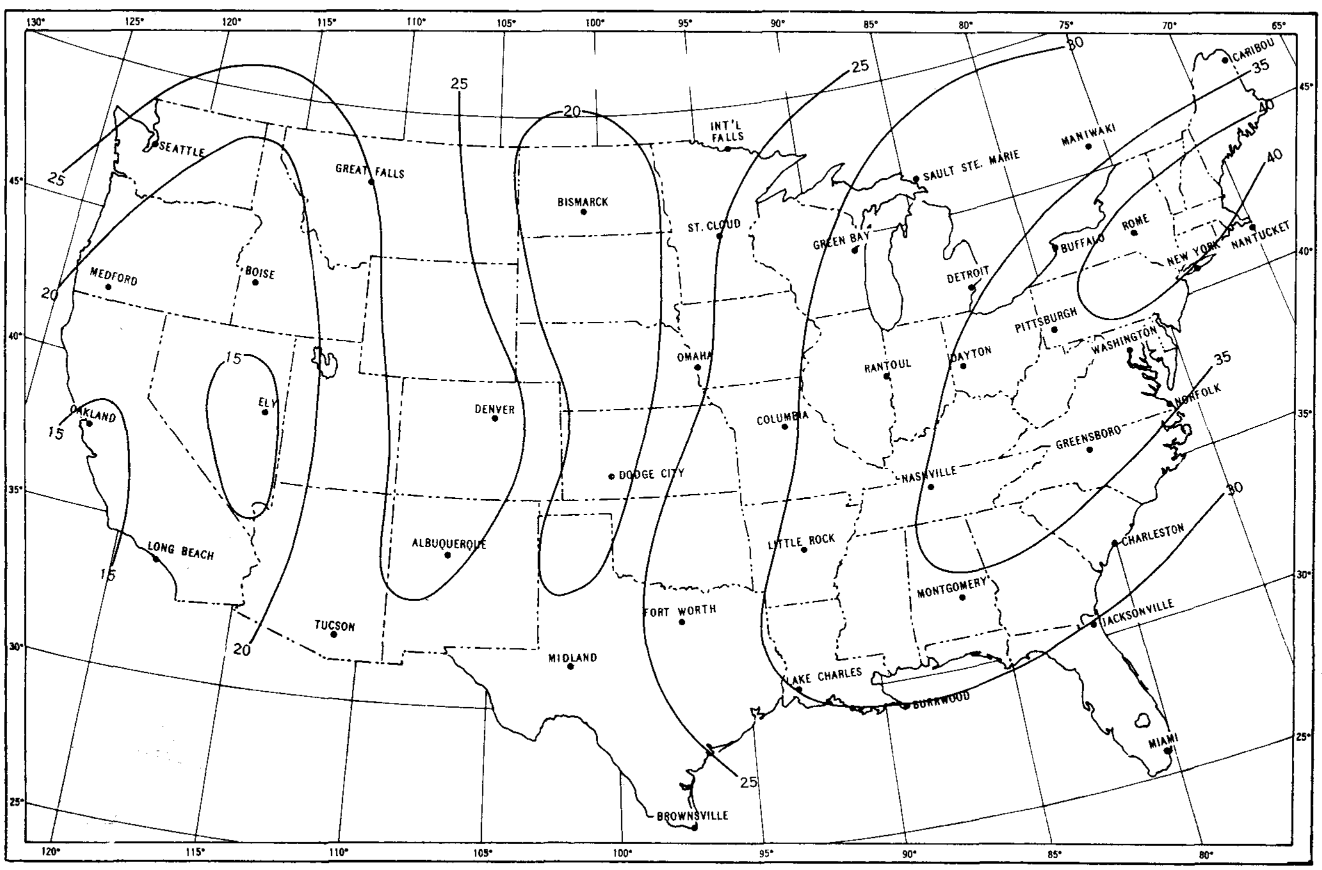

FIGURE 3.—Percentage of soundings with winds ≧ 100 m.p.h. All months 1957–58.

Clapp [2]. It is concentrated just north of the Gulf of Mexico inland and extends eastward to Cape Hatteras. At that point on the Atlantic coast not less than 77 percent of the ascents showed winds $\geqq$100 m.p.h. in the two Januarys.

During July, shown in figure 2, the maximum of high wind frequencies occurs just north of the Great Lakes and extends eastward to the St. Lawrence Valley. A little over 30 percent of the observations in this area show high winds aloft. The core seems to be a little farther east than in the corresponding average jet stream position of Namias and Clapp [2]. This difference may well be caused by the very short record in our series, while their data were based on calculations from mean upper-air charts. Notable in figure 2 is the almost complete absence of winds above 100 m.p.h. south of 35° N. latitude.

The mean annual pattern shown in figure 3, although a mixture of all seasons, has the virtue of having the highest number of observations. These average about 730 per station in the chosen network. The meridional pattern is quite pronounced. There is no zonal high-speed band, at least for the frequencies of winds $\geqq$100 m.p.h. These high speeds are most common over the northeastern area where they reach over 40 percent of all observations. This maximum is located at about 42° N. latitude.

Interesting also is the narrow zone of increased high-speed wind frequency just east of the Rocky Mountains, followed immediately to the east by a minimum over the Great Plains. Also notable is the low frequency of high-speed winds over the central California coast. An effect of the High Sierras is possible but can not be documented by the present network.

The distribution east of the Rocky Mountains can be explained by the presence of a dynamic trough in the lee of the mountains. Boffi [1] discussed this in connection with his analysis of the stream field produced by the Andes. The marked asymmetry of west and east coasts has already been commented upon by Riehl et al. [3]. The northeast maximum in the annual pattern as well as the winter maximum centered over the Carolinas and Georgia would seem to require injection of additional energy into the basic dynamic system envisaged by Rossby [4]. Previous writers have belittled the idea of thermal contrasts being associated with the development of wind patterns. Perhaps in conjunction with conversion of latent heat into kinetic energy the thermal contrasts are likely to contribute both to the frequency and the specific latitudinal distribution of the high speed jet streams.

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